

Postings: from the desk of Jim Brodrick

No developing technology can achieve its potential without standards and test methods to characterize product performance and safety, and solid-state lighting (SSL) is no exception. That's why DOE has been working since 2006 to accelerate the development and implementation of SSL standards in a number of ways – hosting workshops that convene key standards organizations, working closely with these organizations, and providing them with technical support.

There's been a lot of progress on the standards front since I last wrote about the topic, so I thought I'd give you an update on where things currently stand. The most recent development was the publishing last week of a white paper on dimming by the National Electrical Manufacturers Association (NEMA). The paper, LSD 49-2010, describes current LED product dimming issues and offers best-practice guidance on application. It serves as the precursor to a NEMA standard that, when completed, will provide appropriate metrics for evaluating LED dimming performance and capability. A final step in the process will include applying American National Standards Institute (ANSI) status to the new standard. LSD 49-2010 is available from the [NEMA website](#).

Another recently published NEMA white paper, LSD 45-2010, discusses interconnect issues for LED products and their integration into luminaires. The interconnection of LED sub-assemblies (modules and arrays) with luminaire housings and structures is critical to the success of LED products. Universal thermal and electrical connection formats will enable more effective and user-

friendly luminaire development. LSD 45-2010 serves as documentation of the relevant issues, while offering recommended standardization protocols that may soon be used to develop a standard for the industry. It is available from the [NEMA website](#) as well.

On the safety front, Underwriters Laboratories (UL) has recently published a safety standard for LED products, UL 8750 "Safety Standard for Light Emitting Diode (LED) Equipment for Use in Lighting Products," which replaces the placeholder UL 8750 "Outline of Investigation for LED Light Sources." The new standard specifies the minimum safety requirements for SSL components, including LEDs and LED arrays, power supplies, and control circuitry, and is available from the [UL website](#).

A number of other SSL standards are in various stages of preparation. NEMA SSL-1, "Electric Drivers for LED Devices, Arrays, or Systems," is in final draft stages and is expected to be published this summer. IES methods for measurement of high-power LEDs and IES light engine measurements are in draft development. And additional LED definitions are currently in the approval stages to supplement the existing IES RP-16 Nomenclature and Definitions.

One of the hot topics at the recent DOE SSL R&D Workshop in Raleigh was lifetime. The Illuminating Engineering Society of North America (IES) is currently working on a method of extrapolating the lifetime of LED luminaires, IES TM-21, which is intended for use with IES LM-80. Work on this method continues, with exploration of multiple models and examination of practical applications to effectively estimate lumen depreciation beyond collected data. This important extrapolation method is a difficult nut to crack, and the limited data required by LM-80 (6000 hours) is not sufficient to easily estimate lumen depreciation over the course of the expected long lifetimes of LEDs. With technical support from DOE, the TM-21 working group is completing extensive modeling analysis to identify a reasonable method of estimating lumen depreciation as a metric of

LED expected usefulness over time. Initial conclusions are expected soon.

Another topic of interest in Raleigh was the Color Quality Scale (CQS) being developed by the CIE TC1-69 committee of the International Commission on Illumination (CIE), with support from the National Institute of Standards and Technology (NIST). CQS is intended to replace or supplement the current Color Rendering Index (CRI) metric, which is not accurate for some light source types, including LEDs. The narrow-band emissions from LEDs can result in good CRI scores even when saturated colors render poorly. NIST is currently conducting critical human response studies to help develop an effective color metric that will be useful for all lighting sources, including LEDs. Indications are that NIST will have recommendations for the committee in the next few months, and a complete, usable CQS will follow after committee review and approvals.

A NEMA standard for LED binning, NEMA SSL-3, is in the approval process and is expected to be published by mid-2010. It provides a method for binning high-power white LED packages used in general white-light applications, specifying sorting, grouping, labeling for luminous flux, forward voltage, and chromaticity. This binning characterization is important to luminaire integrators to ensure that the appropriate LED packages are applied for the desired luminaire characteristics.

All of these standards, and others yet to come, will play a huge role in facilitating the development and adoption of solid-state lighting. Standards work is painstaking, unglamorous, and often thankless, but it's an essential part of advancing any new technology. Hats off to all the unsung heroes out there in the standards trenches – your efforts benefit us all and are much appreciated.

As always, if you have questions or comments, you can reach me at postings@lightingfacts.com.

James R. Brodrick
